

HILARY KATHERINE McMILLAN

Department of Geography, San Diego State University, San Diego, CA 92182-4493
Email: hmcmillan@sdsu.edu, Office Phone: (619) 594-2401

HIGHER EDUCATION

- 2002-2006 **PhD** Department of Geography, Cambridge University, UK
Thesis '*End-to-End Flood Risk Assessment: A Coupled Model Cascade with Uncertainty Estimation*'
- 2001-2002 **MRes Science of the Environment, Distinction** Lancaster University, UK
Thesis '*Discharge Estimation in ungauged sub-catchments of the River Eden, UK*'
- 1996-1999 **MA Mathematics, 1st Class** Cambridge University, UK

WORK HISTORY

- 2018 to date **Associate Professor of Water Resources.** Dept of Geography, San Diego State University, US.
- 2016-2018 **Associate Professor of Water Resources (without Tenure).** Dept of Geography, San Diego State University, US.
- 2007-2016 **Hydrological Scientist.** Hydrological Processes group, National Institute of Water and Atmospheric Research (NIWA), Christchurch, New Zealand.
- 2006-2007 **Marsden Postdoctoral Fellow.** Massey University, Palmerston North, New Zealand.
'*Hyperconcentrated flow dynamics in volcanic lahars*'

RESEARCH GRANTS HELD

[All figures given in US\$ equivalents if awarded overseas]

- 2019-2020 \$9,919, PI. *Mapping how urban landscapes control flood magnitude in Southern California.* SDSU University Grants Program.
- 2018-2019 \$9,988, PI. *Urban agriculture: Environmental resource or environmental pressure?*, SDSU University Grants Program.
- 2017-2019 \$65,216, PI. *Surface Water Isotope Composition in Mission Valley.* City of San Diego.
- 2012-2016 \$2,800,000, PI. *Waterscape 2*, MBIE (Ministry for Business, Innovation and Employment) research grant (NZ)
- 2010-2016 \$2,600,000, AI. *Reducing the impacts of Weather Related Hazards*, MBIE research grant (NZ). [Dollar value quoted is the portion of the total grant for which I was project leader]
- 2010-2012 \$350,000, AI. *Catchment Hydrology*, AI, MBIE research grant (NZ).
- 2012-2013 \$23,000, PI. *Waterscape Hawkes Bay.* National Institute for Water and Atmospheric Research (NIWA, NZ).
- 2011-2012 \$46,000, PI. *Water tracking hydrological model for contaminant transfer.* NIWA, NZ
- 2010-2011 \$40,000, PI. *Water and Contaminant Tracking.* NIWA, NZ
- 2009-2010 \$112,000, PI. '*Flood Risk under Climate Change*'. Ministry for Agriculture and Forestry (NZ).
- 2009-2010 \$54,000, PI. '*Improvements in hydrological process modelling for applications in flow forecasting*', NIWA, NZ.
- 2008-2009 \$54,000, PI. '*Hydrological model calibration in catchments with heterogeneous geology*', NIWA, NZ
- 2009 \$4,000. International Science and Technology Linkages Fund, Royal Society of NZ.

INVITED/KEYNOTE PRESENTATIONS

- 2018 Invited speaker at American Geophysical Union conference (AGU), San Francisco. “*Using hydrologic signatures to extract information from data and evaluate models across scales*”
- 2017 Seminar Speaker at UC Santa Barbara and UC Irvine, ‘*Hydrological Signatures: Windows into a Watershed*’. [Many earlier seminar presentations omitted]
- 2017 Keynote speaker to workshop on Improving the theoretical underpinnings of hydrologic models, Sopron, Hungary “*Towards hydrologic models for a world of human impacts*”
- 2016 Invited speaker at European Geosciences Union conference (EGU), Vienna, Austria, “*Catchment water storage: Models vs Measurements*”
- 2015 Keynote speaker to Berkeley Catchment Symposium, San Francisco, “*Where do national hydrology models perform well or badly and why?*”
- 2015 Invited speaker at AGU, San Francisco, “*Hydrological Uncertainty: Reasons to Be Cheerful*”
- 2015 Keynote speaker to Gordon Research Conference on Catchment Science, Boston, ‘*Hydrological signatures: use and abuse*’.
- 2013 Invited speaker at AGU, San Francisco, ‘*Benchmarking Uncertainty for Hydrology*’
- 2013 Invited speaker at EGU, Vienna, Austria, ‘*Spatial organisation in hydrological model structures*’
- 2012 Keynote speaker ‘*Making the most of hydrological data*’ and invited speaker ‘*Using data from research basins to identify appropriate model structures*’ at IAHS Conference in Delft, Netherlands

SCHOLARLY AWARDS

- 2018 Excellence in Research Award for Tenure-Track Faculty, SDSU College of Arts and Letters
- 2012 American Geophysical Union 2012 Editor’s Citation for Excellence in Refereeing
- 2002 - 2003 Selwyn College Graduate Scholarship (for distinction in postgraduate study)
- 2002 - 2005 Natural Environment Research Council UK (NERC) PhD Scholarship with NERC PhD CASE Award (Co-operative Award in Science and Engineering).
- 2001 - 2002 Natural Environment Research Council UK (NERC) Masters Scholarship.

TEACHING EXPERIENCE

Instruction (at San Diego State University)

- Practical Hydrologic Modeling* Postgraduate/Undergraduate, Spring 2019.
- Hydrology and Global Environmental Change* Postgraduate/Undergraduate, Spring 2017, Spring 2018, Fall 2018.
- Environmental Hydrology* Undergraduate, Fall 2016, Fall 2017, Fall 2018.

Doctoral Advising

- 2018 to date PhD Committee Chair, D. Kim, San Diego State University. ‘*Hydrologic modeling of heterogeneous urban landscapes*’
- 2016 to date PhD Committee External Member, I. Horner, IRSTEA, France. ‘*Diagnostic-evaluation of distributed models using hydrological signatures*’.
- 2015 PhD Internship Advisor, T. Euser, TU Delft, Netherlands. ‘*Influence of soil and climate on root zone storage capacity*’.

Masters Advising (at San Diego State University unless specified)

- 2017 to date MS Committee Chair, S. Wallace. ‘*Isotopic separation of groundwater recharge sources, San Diego*’

- 2017 to date MS Committee Chair, A. Scurlock. *'Hydrologic benefits and stressors of urban agriculture'*
- 2017 to date MS Committee Member, C. Monteverde. *'Climate Change Impacts on Winegrowing Regions in Southern California: From the Perspective of a Regional Climate Model.'*
- 2016 - 2018 MS Committee Member, R. Feddema. *'Groundwater quality change in the Mexicali valley, Mexico'*
- 2016 - 2018 MS Committee Member, L. Barrett. *'Runoff Sensitivity to Climate Variability in California.'*
- 2018 to date MS Thesis Advisor, M. Ende, U. Amsterdam, *'Urban irrigation in the WRF-Hydro model'*
- 2011 MS Committee Co-Chair, D. Gawith, Otago University, NZ. *'Climate change effects on runoff in the Lindis and Matukituki catchments, Otago, NZ'*
- 2010 MS Thesis Advisor, M. Gaj, Freiburg University, Germany. *'Hydrological soil response in NZ'*

Bachelors Honors Advising (Overseas students undertaking theses at NIWA Research Institute, NZ)

- 2014 M. Douziech, ETH Zürich, Switzerland. *'Analysis of high and low resolution numerical weather prediction model inputs and their influence on hydrological model flow predictions'*.
- 2013 A. Gago, Montpellier University, France. *'Storm responses of soil moisture, groundwater and flow'*
- 2013 T. Finucane, Birmingham University, UK. *'Groundwater and surface water interactions interpreted from piezometer, flow gauge and shallow well data'*
- 2012 M. Gueguen, Montpellier SupAgro, France. *'Controls on runoff ratio in Mahurangi Catchment, NZ'*.
- 2010 E. Grimon, Birmingham University, UK. *'Hydrologic recession behaviour in small catchments'*.

Workshop Organisation

- 2010 *Hydrologic Impacts of Climate Change*. New Zealand Hydrological Society, Dunedin, NZ.
- 2009 *Managing with Uncertainty*. New Zealand Hydrological Society, Whangarei, NZ.

PROFESSIONAL SERVICE

- 2019 Theme Leader for CUAHSI National Water Center Innovators Program Summer Institute, *'Scaling hydrologic and hydraulic models from small basins to regional watersheds'*
- 2018 to date Member of American Geophysical Union Technical Committee on *Catchment Hydrology*
- 2018 External expert advisor on search committee for Associate Senior Lecturer in Surface Water Hydrology (Tenure-track) at Uppsala University, Sweden
- 2017 External PhD examiner for Dr. T. de Boer-Euser, TU Delft, Netherlands
- 2016 to date Associate Editor for *Hydrological Processes* and *Hydrology and Earth System Sciences*
- 2015 - 2017 Chair of International Association of Hydrological Sciences (IAHS) Flagship project *'Panta Rhei: Hydrology, Society and Change'*
- 2014 - 2017 Hydrology Editor for EGU/Copernicus journal *Geoscientific Model Development*
- 2013 - 2016 Invited member of USGS Powell Center international working group on *'Water Availability for Ungauged Rivers'*
- 2013 - 2015 Objective Leader 'Science Understanding' IAHS *Panta Rhei* Biennium 2013-2015
- 2010 to date Grant proposal reviewer for NSF, Swiss National Science Foundation, Luxembourg National Research Fund, and Netherlands Organisation for Scientific Research.
- 2007 to date Regular reviewer for *Water Resources Research*, *Journal of Hydrology*, *Hydrological Processes*, and *Hydrology and Earth System Sciences*

PUBLICATIONS

Journal articles

1. Kiang, J., Gazoorian, C., **McMillan, H.**, et al. (2018). A Comparison of Methods for Streamflow Uncertainty Estimation. *Water Resources Research*, 54, 7149–7176.
2. **McMillan, H.**, Westerberg, I., Krueger, T. (2018). Hydrological data uncertainty and its implications. *WIREs Water*, 2018(5) doi: 10.1002/wat2.1319
3. Horner, I., Renard, B., Le Coz, J., Branger, F., **McMillan, H.**, Pierrefeu, G. (2018). Impact of stage measurement errors on streamflow uncertainty. *Water Resources Research*, 54 (3): 1952-1976.
4. **McMillan, H.**, Westerberg, I., & Branger, F. (2017). Five Guidelines for Selecting Hydrological Signatures. *Hydrological Processes* 2017, 1-5.
5. **McMillan, H.**, Seibert, J., Petersen-Overleir, A., et al. (2017). How uncertainty analysis of streamflow data can reduce costs and promote robust decisions in water management applications. *Water Resources Research* 53, 5220–5228.
6. **McMillan, H.**, Booker, D.J., Cattoën, C., (2016). Validation of a national hydrological model. *Journal of Hydrology*. 51 (b): 800:815.
7. de Boer -Euser, T., **McMillan, H.**, Hrachowitz, M., Winsemius, H. C., Savenije, H. H. (2016). Influence of soil and climate on root zone storage capacity. *Water Resources Research* 52, 2009–2024.
8. Yang, J., **McMillan, H.**, Zammit, C. (2016) Modeling surface water–groundwater interaction in New Zealand: Model development and application. *Hydrological Processes*, doi: 10.1002/hyp.11075.
9. Kreibich, H., Krueger, T., Van Loon, A., Mejia, A., Liu, J., **McMillan, H.**, & Castellarin, A. (2016). Scientific debate of Panta Rhei research—how to advance our knowledge of changes in hydrology and society? *Hydrological Sciences Journal* 0, 0:1-3.
10. Singh, S.K., **McMillan, H.**, Bárdossy, A., Chebana, F., (2016). Non-parametric catchment clustering using the data depth function. *Hydrological Sciences Journal* 61, 15: 2649-2667.
11. **McMillan, H.**, Montanari, A., Cudennec, C., et al. (2016). Panta Rhei 2013–2015: global perspectives on hydrology, society and change. *Hydrological Sciences Journal*, 61(7), pp.1174-1191.
12. Cattoen, C., **McMillan, H.**, Moore, S. (2016) Coupling a high-resolution weather model with a hydrological model for flood forecasting in New Zealand, *Journal of Hydrology (NZ)* 55 (1), 1
13. Archfield, S., Clark, M., [...] **McMillan, H.** et al. (2016) *Water Resources Research*. Accelerating advances in continental domain hydrologic modeling. 51(12): 10078-10091
14. Westerberg, I., Wagener, T., Coxon, G., **McMillan, H.**, et al. (2016) Uncertainty in hydrological signatures for gauged and ungauged catchments. *Water Resources Research*. 52, 1847–1865
15. Srinivasan, MS., Duncan, M., **McMillan, H.**, (2016) Field measurement of recharge under irrigation in Canterbury, New Zealand, using drainage lysimeters. *Agricultural Water Management* 166, 17 – 32.
16. Mizukami, N., Clark, M. [...] **McMillan, H.** (2016) mizuRoute (version 1) - river network routing tool for continental domain water resources applications. *Geoscientific Model Development* 9 (6), 2223-2238.
17. Westerberg, I., **McMillan, H.** (2015) Uncertainty in hydrological signatures, *Hydrol. Earth Syst. Sci.*, 12, 4233-4270, doi:10.5194/hessd-12-4233-2015, 2015.
18. Pechlivanidis, I., Jackson, B., **McMillan, H.**, Gupta, H. (2016). Robust informational entropy-based descriptors of flow in catchment hydrology. *Hydrological Sciences Journal*. 61 (1), 1 – 18
19. **McMillan, H.**, Srinivasan MS. (2015) Characteristics and controls of variability in surface and groundwaters in a headwater catchment. *Hydrology and Earth System Sciences* 19, p 1767-1786.
20. **McMillan, H.**, Westerberg, I. (2015) Rating curve estimation under epistemic uncertainty. *Hydrological Processes* 29: 1873–1882.
21. Pechlivanidis, I., Jackson, B., **McMillan, H.**, Gupta, H. (2014). Use of an entropy-based metric in multi-objective calibration to improve model performance. *Water Resources Research* 50(10): 8066–8083.
22. **McMillan H.**, Guegen M, Grimon E, Woods R, Clark M, Rupp D, (2014). Spatial variability of processes and model structure diagnostics in a 50 km² catchment. *Hydrological Processes* 28(18): 4896–4913.

23. Ackerley D, Bell RG, Mullan AB, **McMillan H.** (2013) Estimation of regional departures from global-average sea-level rise around New Zealand from AOGCM simulations. *Weather and Climate*. 33(1):2-22.
24. Montanari, A., [...] **McMillan, H.** et al. (2013) “Panta Rhei – Everything Flows”: Change in hydrology and society – The IAHS Scientific Decade 2013-2022. *Hydrological Sciences Journal* 58(6): 1256–1275.
25. **McMillan H.**, Hreinsson E, Clark M., Singh S., Zammit C., Uddstrom M. (2013) Operational hydrological data assimilation with the Recursive Ensemble Kalman Filter. *Hydrology & Earth System Sciences* 17:21-38
26. Singh SK, **McMillan H.**, Bardossy A. (2013) Use of the data depth function to differentiate between cases of interpolation and extrapolation in hydrological model prediction. *Journal of Hydrology*, 477: 213–228
27. **McMillan H.**, M. Duncan, G. Smart, et al. (2013) The Urban Impacts Toolbox: An example of modelling the effect of climate change and sea level rise on future flooding. *Weather and Climate (NZ)*. 32(2), 21-39
28. **McMillan, H.**, T. Krueger, J. Freer (2012) Benchmarking observational uncertainties for hydrology: Rainfall, river discharge and water quality. *Hydrological Processes*, 26 (26): 4078 -4111
29. Gawith, D., Kingston, D.G., **McMillan, H.** (2012) The effects of climate change on runoff in the Lindis and Matukituki catchments, Central Otago, New Zealand. *Journal of Hydrology (NZ)* 51(2): 121-136
30. **McMillan, H.**, D. Tetzlaff, M. Clark, C. Soulsby (2012) Do time variable tracers aid the evaluation of hydrological model structure? A multi-model approach. *Water Resources Research*. 48, W05501
31. **McMillan, H.** (2012) Effect of spatial variability and seasonality in soil moisture on drainage thresholds and fluxes in a conceptual hydrological model. *Hydrological Processes* 26(18): 2838–2844
32. Pechlivanidis, I.G., Jackson, B., **McMillan, H.** Gupta, H. (2012). Using an informational entropy-based metric as a diagnostic of flow duration to drive model parameter identification. *Global Network Environmental Science & Technology Journal*, 14(3): 325-334
33. Poyck, S., Hendriks, J., **McMillan, H.**, Hreinsson, E., Woods, R. (2011) Combined snow- and streamflow modelling to estimate impacts of climate change on water resources in the Clutha, New Zealand. *Journal of Hydrology (NZ)* 50: 293-312
34. **McMillan, H.**, Clark M., Bowden W., Duncan M., Woods R. (2011). Hydrological field data from a modeller’s perspective: Part 1. Diagnostic tests for model structure. *Hydrological Processes*. 25: 511-522
35. Clark M., **McMillan, H.**, Collins D., Kavetski D., Woods R. (2011). Hydrological field data from a modeller’s perspective: Part 2. Process-based evaluation of model hypotheses. *Hydrological Processes*, doi: 10.1002/hyp.7902
36. **McMillan, H.**, Jackson B., Clark M., Kavetski D., Woods R. (2011) Rainfall Uncertainty in Hydrological Modelling: An Evaluation of Multiplicative Error Models. *Journal of Hydrology*. 400(1-2): 83-94
37. **McMillan, H.**, Freer, J., Pappenberger, F., Krueger, T., Clark, M. (2010). Impacts of Uncertain River Flow Data on Rainfall-Runoff Model Calibration and Discharge Predictions. *Hydrological Processes* 24(10):1270-1284.
38. **McMillan, H.**, Clark, M. (2009), Rainfall-runoff model calibration using informal likelihood measures within a Markov Chain Monte Carlo sampling scheme, *Water Resources Research*, 45, W04418.
39. **McMillan, H.**, Brasington, J. (2008). End-to-End Flood Risk Assessment: A Coupled Model Cascade with Uncertainty Estimation. *Water Resources Research* 44, W03419, doi:10.1029/2007WR005995.
40. **McMillan, H.**, Brasington J. (2006). Reduced Complexity Strategies for Modelling Urban Floodplain Inundation. *Geomorphology*, 90: 3-4, p 226-243.
41. Freer, J., **McMillan, H.**, McDonnell, J.J., Beven, K.J. (2004). Constraining dynamic TOPMODEL responses for imprecise water table information using fuzzy rule based performance measures. *Journal of Hydrology* 291, p 254-277.

Book Chapters

1. **McMillan, H.**, Caruso, B., Srinivasan, M.S. (2016). *Lateral hydrological processes*. In: Advances in New Zealand Freshwater Science, Eds: Jellyman, P., et al. NZ Hydrologic & Freshwater Sciences Societies.
2. Srinivasan, M.S., Wohling, T., Campbell, D. **McMillan, H.** (2016). *Vertical hydrology*. In: Advances in New Zealand Freshwater Science, Eds: Jellyman, P., et al. NZ Hydrologic & Freshwater Sciences Societies.